Unit 5

Occupational Health, Hygiene and First Aid Practices

Introduction

Occupational health deals with the control of health hazards that may arise while doing an agricultural work in a farm or a laboratory. It relates to recognising, anticipating, evaluating and controlling those environmental factors at a workplace, which may be a reason of some health issues. Despite taking all precautions and care, often accidents occur while handling and applying chemicals and bio-agents. It is essential for students to know about immediate medical aid that must be administered, in case a chemical or mechanical accident occurs in a farm or a lab, and learn about the safety measures that they need to adopt in order to prevent such hazards.

Session 1: Prevent Hazardous Conditions at Workplace

Hazard

A hazard may be defined as a condition that has the potential to cause an injury to human beings and adversely affect the environment. A hazard can lead to adverse health effects and physical damage under certain situations at a workplace. Fig. 5.1 shows the different types of hazards.

Types of hazards

Natural hazards

These hazards occur because of natural incidents, which may include meteorological (e.g., heavy rains and floods), geological (e.g., landslides and earthquakes), and biological (e.g., gas leaks) factors. Examples of natural hazards are cyclone, earthquake, tsunami and volcanic eruption. Landslide, drought, flood and fire are socio-natural or hybrid hazards as their causes may be both natural and manmade. The natural hazards threatening India include earthquakes (usually, in the Himalayan region), floods, including tsunamis (usually, in river deltas and coastal areas), and landslides (usually, in hilly areas during heavy rains).

Fig. 5.1: Types of hazards

Mechanical hazards

They are related to poorly designed and ill-maintained agricultural machinery.

Hazards related to pesticides and chemicals

Pesticides are solutions meant for destroying, mitigating and controlling pests. Accidental death from pesticides is a rarity but skin infections and disorders, and health issues may occur, if timely precautions are not taken (Fig. 5.2). Careless handling or use of pesticides can cause harmful effects to the environment and human beings. Precautions must be taken during the selection of pesticides, their transportation, loading, mixing, application, storage and container disposal (Fig. 5.3 and 5.4).

Fig. 5.2: Safety measures being adopted while preparing a pesticide solution

Pesticides may enter our food in the following ways:

- extensive use in growing crops
- frequent and unwanted application by a grower in a crop
- application of poor quality pesticides by the grower
- a pesticide dealer cheats farmers by giving wrong advice and supplying poor quality of pesticides
- continuance of banned pesticides
- liquid waste from pesticide manufacturing units

Fig. 5.3: Signage indicating pesticide spraying in progress

Fig. 5.4: Signage indicating pesticide application in a field

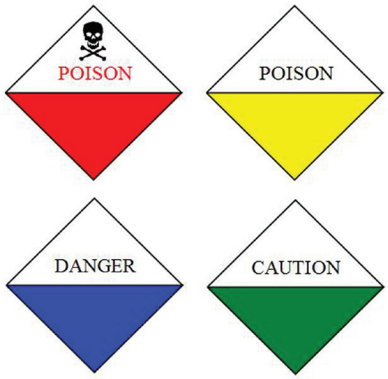


Fig. 5.5: Colours showing toxicity labels of pesticides

- unsafe disposal of leftover pesticides and cleaning of plant protection equipment
- pesticide production and marketing

Precautions

Toxicity labels marked on the pesticide packing, as shown in Fig. 5.5, must be taken into account while using pesticides.

- Chemicals should not be sprayed in foggy and windy weather.
- A person spraying chemicals should not have an open injury on his/her body.

Accidents

Accidents are unfortunate incidents attributable to various factors that a person faces during work, causing physical injury, death and acute poisoning when exposed to a toxic product even for a short duration.

Occupational hazards at agricultural farm

Farmers and workers, while working in an agricultural farm, can suffer from a number of occupational hazards. These include hazards related to farm machinery, biological and chemical hazards, and stress. The hazards may cause injuries, health disorders or diseases. Some of the reasons for injuries and accidents at agricultural farms are as follows:

- being hit by a moving vehicle
- falling from height
- contact with large animals
- contact with a heavy falling object or material
- contact with a farm machinery
- drowning
- musculo-skeletal injury (aches, sprains or strains)
- effects of toxic chemicals through inhalation or exposed body parts

Hazards related to animals

Injuries inflicted by animals include bites, kicks, crushing and transmission of certain infectious diseases. If a farmer or a person working in a field gets injured by a farm animal, immediate first aid must

be administered to him/her and required medical procedures be followed. Injuries from cattle relate to a number of factors, including lack of trained workers, unsafe work practices, weight of an animal, stress and sometimes the behaviour of the animal.

- Hazards by animals may vary as per their age, breed, sex, weight, temperament, horn status and training imparted to them.
- It is also in look, heifers can be dangerous at the time of weaning.
- Cattle, kept isolated, are likely to be more aggressive when approached.
- Cattle with sharp and pointed horns are dangerous, therefore, dehorning is recommended.

Ergonomic hazards

These are caused by inappropriate and cumbersome postures, leading to damage or pain in muscles and tendons. These are mainly caused while working on or with poorly designed tools.

Hazards related to electricity

An electric hazard arises due to faulty switches and machines, poor quality cords, overhead power lines, etc. Faulty electrical installations and use of cheap quality equipment can even cause fires (Fig. 5.6). When an equipment or a machinery gets close to a high tension line, it can lead to electric shocks, causing injury to the driver or the person handling it.

In some severe cases, it can even lead to electrocution, causing permanent disability or death of a person.

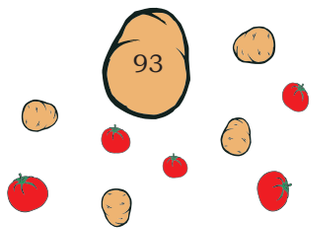
Fig. 5.6: Electricity hazard sign

Hazards related to heights

Hazards related to heights include falls from ladders, rooftops, farm machinery, tractors and windmills. These are major causes of injury. The following precautions must be taken to prevent hazards due to heights (Fig. 5.7):

- Always wear safety and protective devices, such as headgear, while working on rooftops.
- Climbing ladders should be strong, unbreakable and non-slippery.
- An attendant must always hold the ladder.

Fig. 5.7: Height hazard sign



- A worker must hook an elastic rope around his waist that has one end locked while working at heights.

Hazards related to water

Floods, droughts and other water related hazards have major impacts on the socio-economic status of farmers. Lakes, ponds, wells, rivers, channels, tanks, etc., — all are hazardous, especially for young children. Children playing on farmland should be cautioned not to go near water bodies.

Hazards related to extreme weather

Hazards due to extreme weather conditions in an agricultural farm may occur due to sunburn, heatstroke, dehydration and extreme exposure to cold.

Risk

Risk may be defined as the danger of loss from unforeseen circumstances. It is a measure of the potential danger associated with an activity. Understanding the kind of harm that a machinery may cause a farm worker or assessing the risk helps design and implement strategic and operational plans for the mitigation of hazards. For example, the main hazard of a power-driven machine is that of its getting trapped or entangled in wires, ropes, etc. The risk may be high if one does not fit guards to the machine or train the staff in handling it. If the machine is properly handled and timely maintained, the risk automatically gets reduced.

Risk assessment is a careful lookout at what could be the cause of harm to workers or other people present on a site. There are no fixed rules to conduct a risk assessment, even though some well-defined norms must always be taken into account, such as legislation, regulations, technical norms, codes of practice, principles of risks prevention, etc. These, along with the following measures, can help avert an accident in a farm.

- identification of dangers in every aspect of a work
- identification of people who may be exposed to particular risks
- the reliability and adequacy of existing precautionary or preventive measures

- decision on new measures that should be introduced to eliminate or reduce risks

Disaster

Besides hazards, the farming community also has to face various types of natural and manmade disasters. A disaster can be termed as as "a sudden misfortune that causes a great damage to life". In other words, it can be explained as "an unexpected event whose consequences are seriously destructive".

A disaster can be a combination of a hazard, vulnerability and insufficient capacity of individuals or a community to minimise the potential probability of a risk. It can either be natural, i.e., floods, cyclones, droughts, earthquakes, etc., or manmade, such as riots, fires, conflicts, epidemics, industrial accidents, environmental fallouts, etc.

What have you learned?

Now, I am able to:

- differentiate between risk and hazard.
- understand the common hazards that can occur in an agricultural farm.

Practical Exercises

Activity 1: Prepare a flow chart on types of hazards at a workplace

Material required: Chart paper, pencil, scale and sketch pens

Procedure

- Take a chart paper and draw a flow chart depicting the different types of hazards at a workplace.
- Discuss it in the class with other students.

Check Your Progress

Fill in the Blanks

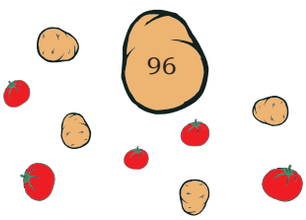
1. Substances intended for preventing and mitigating pests are called _____.
2. Hazards related to agricultural machinery are called _____.
3. Keep electrical equipment away from _____.
4. Risk is defined as the danger of loss from _____ circumstances.

Multiple Choice Questions

1. Ergonomic hazards are caused by _____.
   (a) poorly designed tools
   (b) machinery
   (c) chemicals
   (d) electricity
2. The use of dangerous substances comes under _____.
   (a) ergonomic hazard (b) extreme weather hazards
   (c) chemical hazards (e) natural hazards
3. Hazards due to agricultural machinery are _____.
   (a) electrical (b) mechanical
   (c) chemical (d) none of these
4. Electrical hazards arise due to _____.
   (a) faulty switches
   (b) spray chemicals
   (c) farm animals
   (d) all of the above
5. Extreme toxic label for pesticide is denoted by _____.
   (a) blue (b) green
   (c) yellow (d) red
6. Pesticides should be sprayed during _____.
   (a) rainy and windy days
   (b) sunny and clear days
   (d) foggy days
   (e) any weather

Descriptive Questions

1. Define hazards.
   _____
   _____
   _____
2. List the various types of hazards related to agriculture and discuss them in brief.
   _____
   _____
   _____
3. Discuss the ways in which pesticides enter our food items.
   _____
   _____
   _____
4. Give one example each of hazards related to height, extreme weather, chemicals and animals.
   _____
   _____
   _____



5. Differentiate between the following:
   (a) Hazard and disaster
   (b) Hazard and risk
   (c) Natural and manmade disaster
   (d) Chemical and biological disaster

_____

_____

_____

Session 2: First Aid, Treatment and Safety Equipment

Despite all precautions and care, often accidents take place while handling and applying chemicals. It is essential for students to know about the immediate medical aid that needs to be administered in case of a chemical accident and learn about the safety and protective devices to be put in place to prevent them.

Chemical poisoning and first aid measures

Chemical poisoning may result from continuous contact, absorption of a chemical through the skin, inhalation of toxic vapour, or swallowing a chemical directly during handling or applying. The common symptoms of pesticide poisoning are — headache, vomiting, nausea, tremors, convulsion, difficulty in respiration, etc. A first aid kit with necessary antidotes should be available at the work site for all types of poisoning.

Fig. 5.8: First aid kit

Treatment for simple chemical poisoning

Swallowed poison

If poison is taken internally, vomiting must be induced immediately. Table salt or mustard oil in a glass of warm water is given to the victim for intake. Touching the throat internally with a finger or any blunt and hard

material will also induce vomiting when the stomach is filled with liquid. The process must be continued till a clear liquid starts coming out as in the case of swallowed chemicals, like Carbon disulphide, petroleum products, such as kerosene or petrol, and corrosive acids, or caustic alkalis. If a patient is in coma, convulsion, or in an unconscious state, vomiting must be induced even then. The patient needs to be given large quantities of milk or egg white beaten in water. If poisoning is due to ingestion of mercury compounds, egg white and milk must be given first, and then, vomiting must be induced. After vomiting, soothing substances, like raw egg white mixed with water, butter or cream milk must be given.

Skin contamination

Contaminated clothes must be put off immediately, if you feel like itching or there is smell of a chemical. The contaminated skin must be thoroughly washed with detergent and clean water. Rapid washing is needed to minimise the intensity of the injury.

Eye poisoning

In this case, the eyes of a victim must be washed with plenty of water, keeping the eyelids open. A delay of few seconds may intensify the extent of the injury. Immediate medical aid must be provided.

Inhaled poison

A patient must immediately be shifted to an open area, so that s/he can inhale fresh air. S/he must be asked to be quiet. Loosen her/his clothes and wrap her/him in a blanket to avoid chilling. Artificial breathing must be arranged if the patient is unable to breathe. Artificial respiration technique through the mouth can also be used.

Safety and protective devices

Hazards due to pesticide poisoning can be prevented by using protective and safety devices. The various kinds of pesticide poisoning and their first aid treatment have already been discussed. The safety and protective

equipment (Fig. 5.9 and 5.10) essentially consists of gas mask, gloves, shoes, eye shields, headgear, protective clothing, respiratory devices, etc.

Fig. 5.9: Gloves and headgear

Gas mask

It is a device to protect the eyes and the respiratory tract from toxic gases and aerosols. It gives clean air to the operator by removing contamination from the air by using a filter or bed of absorbent material.

Gloves

Never use gloves made of leather, cotton or any other fluid-absorbing material for handling chemicals. Always use rubber gloves.

Shoes

Shoes made of rubber or any other synthetic material must be used instead of leather or canvas shoes.

Fig. 5.10: Protective clothing

Eye shields

These must be worn to prevent eye poisoning due to pesticides.

Protective clothing

Apron is used while working with treated crops. The skin must be protected entirely. The clothing needs to be washed before re-use.

General health and safety measures

Follow these health and safety measures at a workplace.

- Identify what is unsafe or unhealthy.
- Take required action to solve unsafe or unhygienic issues at the workplace.
- Ensure that problems are solved and will not recur.
- Train workers on how to work safely.
- Design safe work procedures and supervise the workers.
- Provide a first aid kit and have personnel who can administer first aid at the work site.
- Arrange appropriate safety gear (e.g., hats, gloves, reflective vests, etc.) for workers.

Health and safety awareness at workplace

- Awareness campaign may be organised for workers.
- Demonstrate various commitments related to the health and safety of workers by adopting safe work practices.
- Encourage workers to report about health issues, if any, immediately.
- Always wear the required protective equipment and safety gear while working with toxic substances and conduct time-to-time checks if they need to be replaced.
- Ensure that children are always away from high-risk areas, such as tractors, quad bikes, plunge dips, machinery access roads, dams, toxic substances, channels and feed mills.

Amenities and environment

- Ensure that workers have access to toilets.
- They must have access to potable, clean and cool drinking water.
- The work site must have a first aid kit and trained workers who can administer first aid in case of an accident or emergency.
- Maintain ground surrounding near a building to minimise the presence of dangerous creatures (e.g., snakes, spiders, etc.) and reduce fire fuel loads.
- Provide hand wash and face wash to workers.

Emergency response

- Workers must be aware about the procedures that need to be followed in case of an emergency situation.
- Install emergency response equipment at the workplace.
- In case of an emergency, trained workers must be involved in administering the first aid to patients.

Manual tasks

- Maintain appropriate restraint where needed.
- Avoid crush injuries on hands.
- Pay attention to the risk of slips, trips and falls in yards.

Chemicals and hazardous substances

- Safety data sheets (SDS) must be available for all hazardous substances.
- Read the label and safety data sheets carefully and follow the instructions.
- Store the chemicals at a safe place and keep them away from ignition sources.
- Minimise exposure to workers by adopting preventative measures and train them in safe handling techniques.
- Never store toxic chemicals in food and drinking containers.
- Make sure that the chemicals are labelled correctly with relevant instructions.

Plants and machinery

- Supply appropriate plants and equipment.
- Make sure that fixed and mobile plants, and vehicles are in a working condition and have the required safety guards.
- Workers must be trained about the safe use and maintenance of an equipment.
- Train the workers in safety measures in case of falls from heights on fixed plants (e.g., silos and windmills, etc.).

Electricity

- Keep electrical equipment and naked wire away from water or fire.
- Protect all electrical equipment with a residual current device (safety switch).
- Ensure that extension leads are not defective or damaged and that they are uncoiled when plugged into the main switch.
- It must be ensured that all electrical equipment are well-maintained and functioning.
- An electrical equipment must be tested and tagged before use.
- Areas having overhead power cables should be identified with ground markers.
- Apply and mark appropriate exclusion zones while working near power lines.

NOTES

Precautions to be taken in a farm

- Approach cattle quietly as animals feel your presence.
- To avoid kick injuries, try to work either outside an animal's kicking range or directly against it.
- When leading the cattle on a halter, rope must not be wrapped around your arm or hand because the animals may get angry and become out of control.
- While doing grooming, washing, clipping of the cattle, first train the animals to accept intensive handling through gradual familiarisation.
- While preparing a solution, one's face must never be just above the container, in which it is being prepared.
- While using chemicals, one must always wear rubber gloves and mask to avoid direct physical contact or inhalation of chemical fumes.
- Clean the sprayer with a detergent after spraying is completed.
- Follow the instructions mentioned on a pesticide bottle before using it.
- Take bath and wash your clothes after spraying.
- Do not smell, taste or touch a chemical.
- Keep pesticides and other chemicals away from children's reach.

What have you learned?

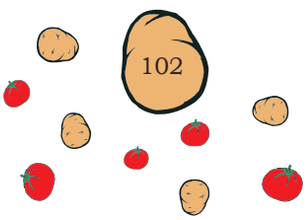
Now, I am able to:

- explain the first aid treatment that needs to be administered in case of chemical poisoning.
- understand the importance and use of safety and protective devices.
- understand the measures that need to be followed for general health and safety.
- understand the precautions that must be taken in an agricultural farm.

Practical Exercises

Activity 1: Demonstration of safety devices and measures to be followed

Material required: First aid kit, gas mask, protective clothing, eye shields, gloves, shoes and pictorial charts



Procedure

- See the different types of protective devices used while handling and applying chemicals. Have a discussion about each device.
- Understand their usage through pictorial charts. Demonstrate their use in class.
- Look at the first aid box. Identify each item kept in the box and understand their usage.
- Discuss the different types of chemical poisoning and their immediate symptoms.
- Understand the treatment for each type of poisoining through pictorial charts. Do some of the treatments through class demonstrations, if possible.

Activity 2: First aid induction and training for students

Material required: First aid kit, pictorial charts and training manuals

Procedure

- Get all students undergo induction in the beginning of the class.
- Ensure that only experienced trainers are involved in the training process.
- Assess the competence of the students.
- Use only standard procedures, which are recommended by agricultural industries.
- Regularly review the training needs.
- Keep records of training and completed inductions.
- Ensure that all students are aware of the accepted safe work procedures.
- Plan the approach before starting the activity and document the safe work procedures that need to be followed.
- Ensure that the first aid kit and emergency response equipment are in place.

Check Your Progress

Fill in the Blanks

1. Vomiting can be induced by using _____.
2. On contaminated skin, _____ must be done.
3. Gas mask is used to protect eyes and respiratory tract from _____.
4. Gloves made of _____ must be used to handle chemicals.
5. _____ is the first aid given in case of inhaled poisoning.

Multiple Choice Questions

1. Common symptoms of pesticide poisoning are:
   (a) headache
   (b) vomiting and nausea
   (c) difficulty in respiration
   (d) all of the above
2. To prevent hazards at workplace, the following material should be put in place:
   (a) SDS
   (b) first aid kit
   (c) protective clothing
   (d) all of the above
3. Protective and safety equipment comprise:
   (a) gas mask (b) gloves
   (c) both a and b (d) none of the above
4. Potential dangerous creatures around house and office buildings include:
   (a) lizards
   (b) snakes
   (c) spiders and scorpions
   (d) all of the above

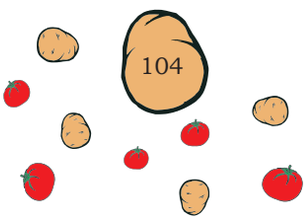
Descriptive Questions

1. What are the first aid treatment measures that need to be adopted in case of chemical poisoning?

   _____
   _____
   _____

2. What are the devices used for protection while working in an agriculture field?

   _____
   _____
   _____



Glossary

Acidic soil: *Soils having pH below 7.*

Adventitious roots: *Such roots arise from an organ of a plant other than the root, like stem.*

Aesthetic: *Concerned with beauty and art, and appreciation of the same.*

Anaemia: *A medical condition characterised by the deficiency of Red Blood Cells.*

Apical dominance: *It is a phenomenon, wherein the central system of a plant is stronger than the side stem.*

Arka: *Prefix of varieties developed at the Indian Institute of Horticultural Research, Bengaluru.*

Aromatic plants: *Plants that exude aroma, and are used in making perfumes and cooking.*

Assimilation: *Absorption or digestion of food or nutrient in a biological system.*

Autoclave: *Equipment used for the sterilisation of soil.*

Bronzing: *Development of yellowish brown colour on the tissues of a plant.*

Beri beri: *A disease causing inflammation of nerves and heart failure.*

C:N ratio: *A ratio of the mass of carbon and nitrogen in a plant or soil.*

Chlorosis: *Loss of the normal green colour in leaves.*

Condiments: *These are used to add flavour to food.*

Cotyledons or endosperm: *These are the organs having reserve food material of the seed.*

Crinkling: *Covered with many small lines and folds (wrinkles).*

Curd: *The edible part of a cauliflower and brocolli.*

Deficiency: *The state of not having enough or lack of something that is essential.*

Deficiency symptoms: *Symptoms that arise in plants and other living beings due to the lack of one or more essential element or nutrient.*

Dehorning: *The process for removing fully grown horns in cattle.*

Depletion: *Exhaustion or reduction in quantity*

Diet: *The kind and amount of food available to or consumed by a person.*

Dietician: *A person trained to give advice on diet and nutrition.*

Dilation of heart: *The chamber of heart, which is enlarged.*

Drained: *To withdraw or drawing of liquid (here water).*

Earthling up: *Making heaps of soil around the stem of a plant to provide support.*

Electrical Conductivity (EC): *The capacity of a substance to conduct or transmit electrical current.*

Embryo: *A young animal or plant in the very early stages of development before birth, or before coming out of its egg or seeds.*

Exudation: *Secretion*

First aid: *Immediate medical treatment given to a person suffering from a sudden illness or injury before the arrival of a doctor or her/him being taken to a hospital.*

Fumigant: *A gaseous or readily volatilisable chemical capable of destroying insects, bacteria and moulds, like Carbon disulphide, Methyl bromide, etc.*

Growth hormones: *A regulatory substance that stimulates specific cells or tissues into action.*

Harbour: *To nourish*

Hardiness: *The character of a plant to survive in unfavourable conditions.*

Harm: *Physical injury or damage to health*

Hazard: *A thing that can be dangerous or cause damage.*

Heifer: *A young cow before it gives birth to its first calf.*

Herbaceous: *Plants having non-woody stem (tender).*

Hydroscopicity: *The character of absorbing moisture from the atmosphere.*

Indeterminate: *A tomato plant that terminates in a vegetative bud.*

Innoculation: *Artificial introduction of microorganicms into a growing medium or living system.*

Intercropping: *The growing of two or more crops together on the same land or raising any crop in the alleys of an orchard.*

Kufri: *Varieties developed by the potato research station at Kufri in Himachal Pradesh.*

Lanky: *Ungracefully thin and tall*

Macro-nutrients: *A chemical, element or substance that is required in large quantity.*

Medicinal: *A substance or plant having healing properties.*

Medium: *The supporting substance on which a plant, fungi, bacteria, etc., are grown or cultured.*

Micro-nutrients: *Essential nutrients required in small quantities.*

Midrib: *The central, thick linear structure that runs along the length of the lamina in a leaf.*

Mortality: *Death*

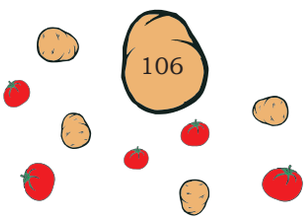
Motting: *Spots or blotches of different colour interspread with the dominant colour.*

Necrosis: *Death of cells or tissues due to severe injury, disease or deficiency.*

Nutrition: *The process of obtaining or providing food.*

Occupational hazards: *Hazards experienced at a workplace.*

Oedema: *Abnormal accumulation of fluid in certain tissues.*



Ornamental plants: *Plants that are grown for decorative purposes in gardens.*

Osteoporosis: *A condition, in which bones become weak and brittle.*

Pellagra: *It is characterised by dermatitis, diarrhoea and mental disturbance.*

Perlite: *An amorphous volcanic glass that has relatively high water content.*

Pesticides: *Chemicals used to control pests.*

Petiole: *The stalk that joins a leaf to the stem.*

Photosynthesis: *A process by which plants manufacture their own food from Carbon dioxide and water in the presence of sunlight.*

Plant nutrients: *Chemical elements and compounds necessary for plant growth and metabolism.*

Plantation: *A large-scale farm specialised in cash crops, including coconut, arecanut, oil palm, cashew nut, coffee and rubber.*

Plumule bud: *Part of a seed that grows into shoots and branches.*

Poison: *A substance capable of causing illness or death, if swallowed or absorbed by the body.*

Polyhouse: *Structure used for controlled farming.*

Polythene mulching: *Covering the exposed area between plants with polythene.*

Propagation: *Method of multiplication of a plant.*

Protective food: *Food that prevents the body from diseases.*

Pusa: *The Indian Agricultural Research Institute (IARI) at Pusa in New Delhi*

Radicle: *Part of a seed that grows into the roots of a plant.*

Recurrent succession: *Consecutively, one after the other*

Rickets: *Softening of the bones*

Rotavator: *A machine with rotating blades used for breaking or tilling the soil.*

Roughage: *Fibrous indigestible component in vegetables that aids the passage of food and waste products through the gut.*

Scorching: *Burning*

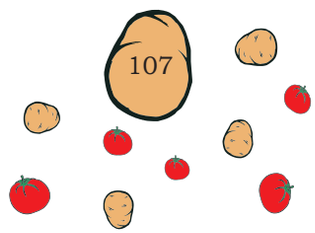
Seed coat: *Outer protective covering of a seed.*

Soil fertility: *The capacity of a soil to supply nutrients.*

Soil reclamation: *It is a process to modify the soil properties for the growth of crops by the application of soil amendments, like gypsum, lime, etc.*

Solanaceous: *Crops belonging to the family 'solanaceae'. The solanaceae family of vegetables includes potato, tomato, brinjal and chilli.*

Solarisation: *Use of solar (Sun) energy*



Spices: *Substances primarily used for flavouring, colouring or preserving food.*

Stumps: *The remaining stem part of harvested crop.*

Sturdy: *Strong*

Subtropical crops: *Crops that require hot and dry climate.*

Succulent: *Juicy*

Symptom: *It is the subjective indication of a disease or a disorder.*

Tanning: *Making lea*

Temperate crops: *Crops that require severe winters to grow and can tolerate freezing temperatures.*

Top-dressing: *It is the application of fertilisers in standing crops.*

Tropical crops: *Crops that require hot and humid climate conditions to grow.*

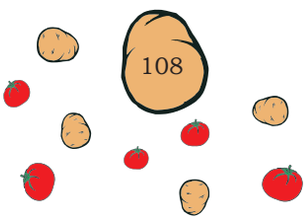
Uprooting: *Pulling out the seedlings without damaging the roots.*

Vermiculite: *A group of hydrated laminar minerals (aluminum, iron and magnesium silicates), which look like mica.*

Viable seed: *A seed that is capable of germination.*

Water holding capacity: *Total amount of water a soil can hold at field capacity.*

Weaning: *Seperation of a calf from a cow or buffalo, and feeding them artificially.*



Suggested Readings

Chadha, K.L. 2010. *Handbook of Horticulture*. ICAR, New Delhi. p. 1069.

Das, P.C. 2004. *Manures and Fertilisers*. Kalyani Publishers, New Delhi.

Premchand, Krishan Pal Singh and Beena Nair. 2014. *Fundamentals of Vegetable Crop Production*. Scientific Publishers. p. 302.

Singh, Jitendra. 2002. *Basic Horticulture*. Kalyani Publishers, New Delhi.

Thamburaj and Narendra Singh. 2015. *Textbook of Vegetables, Tuber Crops and Spices*. ICAR Publication, New Delhi.

http://nhb.gov.in/statistics/PublicationHorticultureAtGlance2017fornetuplod(2).pdf

http://www.manage.gov.in/publications/farmerbook.pdf

Answer Key

UNIT 1: Introduction to Horticulture

Session 1: Horticulture and its Importance

Fill in the Blanks

1. Second
2. Garden and *cultura*
3. Horticulture
4. India
5. First
6. Sloppy lands

Session 2: Branches of Horticulture and Special Horticultural Operations

Fill in the Blanks

1. Biennial crop
2. Curd
3. Annuals
4. October
5. Summer

Multiple Choice Questions

1. (d) 2. (a) 3. (d) 4. (c)
5. (b) 6. (c)

Match the Columns

1. (f) 2. (e) 3. (d) 4. (c)
5. (b) 6. (a)

Session 3: Olericulture and its Importance in Human Nutrition

Fill in the Blanks

1. Olericulture
2. Calcium
3. Vitamin A
4. Vitamin A and C

Multiple Choice Questions

1. (a) 2. (b) 3. (c)

Match the Columns

1. (g) 2. (f) 3. (d) 4. (e)
5. (c) 6. (h) 7. (b) 8. (a)

UNIT 2: Seed Selection and Seedling Production

Session 1: Seed

Fill in the Blanks

1. Determinate type
2. Tomato

3. Arka Shirish
4. Pant C1
5. Kufri Chipsona 1

Multiple Choice Questions

1. (a) 2. (d) 3. (b) 4. (c)
5. (d) 6. (d) 7. (d) 8. (a)

Match the Columns

1. (e) 2. (d) 3. (c)
4. (b) 5. (a)

Session 2: Nursery Bed Preparation and Seed Sowing

Fill in the Blanks

1. Potato
2. Raised
3. 1.20
4. Solarisation
5. *Trichoderma* species
6. 13 to 21°C
7. 2
8. 5
9. Coco peat

Multiple Choice Questions

1. (b) 2. (a) 3. (c) 4. (a)
5. (b) 6. (b)

Match the Columns

1. (b) 2. (d) 3. (a) 4. (c)

Session 3: Nursery Raising in Soilless Medium

Fill in the Blanks

1. 36 or 24
2. Maturity
3. Space
4. Light
5. 238
6. Vermiculite
7. Algae
8. Plugs

Multiple Choice Questions

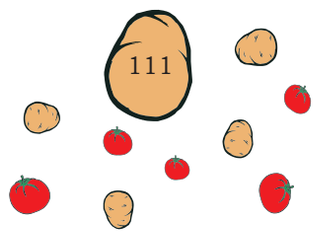
1. (d) 2. (d) 3. (a)

UNIT 3: Field Preparation and Transplanting in Solanaceous Crops

Session 1: Soil and Field Preparation

Fill in the Blanks

1. *Solum*
2. Weathering



3. 7.2 to 8.5
4. Kerala and Tamil Nadu
5. Asparagus and beet root

Multiple Choice Questions

1. (a) 2. (c) 3. (b)
4. (d) 5. (a)

Match the Columns

1. (b) 2. (g) 3. (e) 4. (f)
5. (c) 6. (d) 7. (a)

Session 2: Transplanting of Seedlings

Fill in the Blanks

1. September-October
2. 10–15 cm
3. Staking
4. Transplanting
5. Hardening
6. Tuber
7. 30–32 °C
8. shallow rooted
9. Crop rotation

Multiple Choice Questions

1. (d) 2. (c) 3. (a) 4. (c)
5. (b) 6. (c) 7. (b) 8. (d)

Match the Columns

1. (d) 2. (c) 3. (b) 4. (a)

UNIT 4: Soil Nutrient Management in Vegetable Crops

Session 1: Macro and Micro-nutrients in Soil System

Fill in the Blanks

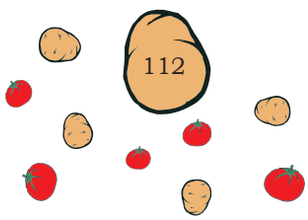
1. Carbohydrates
2. Oxygen
3. Trace
4. Nitrogen
5. Phosphorus
6. Cell wall
7. Fats
8. Maturity
9. Oxidation-reduction
10. Molybdenum

Multiple Choice Questions

1. (c) 2. (d)
3. (b) 4. (d)
5. (d)

Match the Columns

1. (i) 2. (h) 3. (g)



4. (f) 5. (d) 6 (e)
7. (c) 8. (b) 9. (a)

Session 2: Manures and Fertilisers

Fill in the Blanks

1. Vermicompost
2. Basal
3. Foliar application
4. 0.5, 0.2 and 0.5%
5. 0.2–0.3
6. *Rhizobium*

Multiple Choice Questions

1. (c) 2. (d) 3. (c) 4. (a)
5. (a) 6. (c) 7. (d) 8. (d)

Match the Columns

1. (h) 2. (a) 3. (e) 4. (g)
5. (f) 6. (c) 7. (b) 8. (d)

UNIT 5: Occupational Health, Hygiene and First Aid Practices

Session 1: Prevent Hazardous Conditions at Workplace

Fill in the Blanks

1. Pesticide
2. Mechanical hazards
3. Water
4. Unforeseen

Multiple Choice Questions

1. (a) Poorly designed tools
2. (c) Chemical hazard
3. (b) Mechanical
4. (a) Faulty Switches
5. (d) Red
6. (b) Sunny and clear days

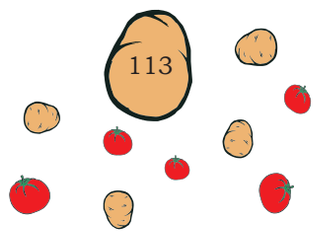
Session 2: First Aid, Treatment and Safety Equipment

Fill in the Blanks

1. Table Salt and mustard oil
2. Rapid washing
3. Toxic gases
4. Rubber
5. Artificial respiration

Multiple Choice Questions

1. (d) 2. (d)
3. (c) 4. (d)



Credits for Illustrations

Shital Hi-Tec Nursery

Unit 1

Fig.1.3, 1.10;

Unit 2

Fig. 2.2, 2.6, 2.7, 2.8, 2.9, 2.10;

Unit 3

Fig. 3.5, 3.6, 3.7;

Unit 4

Fig. 4.11

Books

Fundamental of Horticulture — Practical Manual for Class IX (Unit 1: 1.6, 1.7, 1.8)

Individuals

Uadal Singh

Unit 2

Fig. 2.11, 2.12, 2.13, 2.14;

Unit 3

Fig. 3.4

Unit 4

Fig.4.10)

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Unit 1

Fig 1.2	https://goo.gl/HRZoz6
Fig 1.4	https://goo.gl/W4YJ55
Fig 1.9	https://goo.gl/wWGzwS

Unit 2

Fig 2.1	https://goo.gl/rrCalf
Fig 2.3	https://goo.gl/iCKXBE
Fig 2.4	https://goo.gl/MkztSz
Fig 2.5	https://goo.gl/tQha84

Unit 3

Fig 3.1	https://goo.gl/HdpgjL
Fig 3.2	https://goo.gl/1N3hLH
Fig 3.3	https://goo.gl/pBLLyD
Fig 3.8	https://goo.gl/Qkh3L6

Unit 4

Fig 4.2	https://goo.gl/6zZDoD
Fig 4.3	https://goo.gl/rxnYTm
Fig 4.4	https://goo.gl/4swsR2
Fig 4.5	https://goo.gl/WRXPmi
Fig 4.6	https://goo.gl/FEGd3A
Fig 4.7	https://goo.gl/VBXLCE
Fig 4.8	https://goo.gl/ZSvHXe
Fig 4.9	https://goo.gl/ikY9ma

Unit 5

Fig 5.2	https://goo.gl/nUK73m
Fig 5.3	https://goo.gl/gYYfCW
Fig 5.4	https://goo.gl/ygxajB
Fig 5.5	https://goo.gl/uixDC7
Fig 5.6	https://goo.gl/XzFfqn
Fig 5.7	https://goo.gl/nWpfBV
Fig 5.8	https://goo.gl/BLyejx
Fig 5.9	https://goo.gl/ZvGFsn
Fig 5.10	https://goo.gl/mzBA2Q